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ABSTRACT

This study assesses the effectiveness of admission requirements such as grade point average, GRE test score, personal references, work experience, and personal goals statements in predicting student performance in specific library science classes and throughout a library school Master's program. It is suggested that the factors which predict performance best are different for different classes, but previous grade point average and the GRE quantitative test score predict overall student performance better than any other tested variables. (Author)

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OPTIMIZING SELECTION OF LIBRARY SCHOOL STUDENTS

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This study attempts to assess the effectiveness of admission requirements such as grade point average, GRE test scores, personal references, work experience and personal goals statements in predicting student performance in specific library science classes and throughout a library school Master's program. It is suggested that the factors which predict performance best are different for different classes, but previous grade point average and the GRE quantitative test score predict overall student performance better than any other tested variables.

OPTIMIZING SELECTION OF LIBRARY SCHOOL STUDENTS

BACKGROUND

A wide variety of standards is used by accredited library schools to select acceptable students from applicants for admission.[10] Some limiting criteria, such as undergraduate grade point average (UGPA), are used almost universally, while others, such as performance in personal interviews, are seldom applied.

The selection process has two goals: First to choose potentially successful librarians, and second to choose potentially successful graduate students. It is difficult to measure specific qualities which make an individual likely to succeed as a librarian, especially since it is so difficult to define and measure the qualities of a "good" librarian. Both Baillie[1] and Doyle[4] found slight positive correlation between graduate grade point average (GGPA) and selected measures of library job success. To some extent then, selecting potentially successful students means selecting potentially successful librarians.

It is also difficult to define the qualities of a "good" graduate student. GGPA is the most common measure of graduate scholastic achievement, in spite of its weaknesses.[14] It normally varies over such a narrow range that it can only

be used to discriminate between greatly different levels of performance, and the range of grades seems to be decreasing with time because of grade inflation.[5]

There is evidence that GGPA in individual subject departments is predicted by several selection criteria to varying degrees.[2 7 9 16] Each academic department should therefore seek its own optimum combination of predictors for student selection.

UGPA is the most widely used selection device because of its acceptance as the best predictor of GGPA; most students seem to perform at any given time much as they have in the past. Unfortunately it is a weak predictor. Morris Stein[13] has noted that prediction problems arise from: 1) variability of grading standards at different schools (strikingly illustrated in a study by Schweiker, Demaree and Shah[11]), 2) homogeneity of the student group (A narrow range of values normally correlates less well with another variable than a wide range), and 3) failure to allow for change in the individual.

The second most popular selection device is student performance on tests such as the Graduate Record Examination (GRE). Hoffmann[6] has shown multitudinous dangers inherent in overreliance on tests as predictors of student ability. Willingham[17]

observed that the GRE Advanced tests have greater validity as predictors than the other GRE tests or most GPA's. Examining much of the literature, he found that "a weighted composite including undergraduate GPA and one or more GRE scores typically provides a validity coefficient in the .40-.45 range for various criteria of success and for different academic fields." Unfortunately, there were too few GRE Advanced test results available for the cases in this study sample to test their predictive ability.

Poor prediction from standard scholastic criteria has led some researchers to examine environmental and personality factors for possible influence on performance in school, but with mixed conclusions.[1 13] This study disregards such factors as beyond its scope.

This examination of selection criteria is intended to help determine the comparative values of the factors commonly used to select students for admission to graduate library school programs, so that methods used in selection systems can be based on more than opinion or tradition. Most of the pertinent reports found in the literature are more than a few years old, pertain to other disciplines, and lack sufficient details to give a reader confidence in the methodology and conclusions.

THE ILLINOIS SELECTION SYSTEM

Table I shows how values are assigned to admission variables for each applicant to the University of Illinous Graduate School of Library Science (GSLS). GPA's for the last sixty semester hours of college credit are computed, and converted to a five point scale if necessary. One staff member evaluates all applicants' professional statements to assure uniform grading. Letters of reference are treated similarly. Criteria of "ascendancy" (See Table I.) are the most arbitrarily judged factors because of their many possible variations. They have little impact on the point total, as few applicants are awarded more than five points for ascendancy. When the deadline for submission of applications arrives each year, the total number of points per applicant required for admission is set to a figure that will permit the student openings at the GSLS to be filled.

Admissions criteria are examined frequently by a GSLS faculty committee with heated debate and occasional revisions of the formula. The faculty does agree that a multiple-prediction test which examines the total qualifications of each applicant is more suitable than the assignment of rejection cutoff points to each variable.

CRITERION	MAXIMUM POINTS
* Grade Point Average - Last 60 Hours	
4.0 = 0 5.0 = 1	
Multiplier = 40 1 times 40 =	40
* Graduate Record Examination	
40%ile = 0 100%ile = 60	
Multiplier = .25	
Verbal and quantitative results are added.	
.25 times 60 + .25 times 60 =	30
Foreign Language	
1 year of high school language = 2 points	
1 year of college language = 4 points	
Maximum points =	12
Sequences	
2 courses in science, social science, humanities, elective, each worth 1 point	
Fulfilling all 4 sequences =	5
Paid Library Work Experience	
1 summer session full time = 4	
1 year as a page = 4	
1 year full time = 12	
Maximum points =	12
* Letters of Reference	
Each of three letters to be rated 0 to 5	
Maximum points =	15
* Professional Statement	
Rated 0 to 15	15
Ascendancy	
Leadership or participation	
Honors and Awards	
Related work experience	
Science or math majors	
Other graduate work and degrees	
Maximum points =	20
TOTAL POSSIBLE POINTS =	149

TABLE I. GSLS ADMISSION POINTS ASSIGNMENT.**

* indicates that a factor is examined in this study.

** In 1973 different weighting factors made maximum points for the respective criteria 45, 36, 15, 10, 15, 30, 10 and 15, for a possible total of 176.

THE STUDY

Selection criteria used at the GSLS were examined in two stages: First for correlation with the performance of all the students in specific classes, and second for effectiveness in predicting total performance of Master's degree candidates in the GSLS.

EVALUATION BY CLASS

Twelve library science classes offered in the fall 1975 semester were examined for correlation of student performance with the variables used for admission criteria. The classes were selected as a representative sample of the courses taught by the regular GSLS faculty. Instructors were asked at the end of the semester to rank all the students in each class according to their class performance, or if that were impracticable, to divide them approximately into a top and a bottom half group. It was assumed that the instructors would rank the students by the same criteria that they used for assigning grades. The grades themselves could not be used effectively because of uneven grading practices, e.g., one instructor might give twenty A's and four B's while another did just the opposite.

The population sample was not random. Some students were

judged in more than one class while others were not judged at all. Some of the students were in doctoral, Certificate of Advanced Study and non-candidate-for-degree programs. Class size varied from six to fifty-one students. The small size and uneven nature of the sample of students could have permitted a few unusual cases to have a disproportionate effect on the study findings.

Numeric coefficients of correlation were computed to show the relationship between the students' class performance and admission selection devices. The correlation figures were derived by two methods. Kendall's Tau was used when class rank was available. The biserial correlation coefficient was used when the class was simply divided into two groups by performance.

Correlation coefficients are numeric measures of how variables correlate or vary in relationship to each other. Correlation normally falls between +1 and -1, with +1 indicating total dependence and a direct relationship between variables, 0 indicating that there is no relationship between the tested variables, and -1 indicating total dependence and an inverse relationship. The strengths of relationships shown by different correlation figures are not easily defined in words. Perhaps the best way to understand the relationship indicated by a

number such as 0.35 or -0.6 is to examine examples in basic statistics textbooks. It is important to remember that even the strongest correlation does not show causality. Correlation figures do not indicate if a change in one variable produces change in another or if both are controlled by some third, untested factor.

The correlations, shown in Table II, were much as expected. The factors varied in their ability to predict success in different classes. UGPA was the strongest overall predictor, and personal statements and references (RECS) were weakest. Performance in Automation and Audiovisual Services, the technical classes, appeared to correlate best with the GRE Quantitative (GREQ) percentile scores, while performance in those involving language manipulation, such as Reference, correlated best with the GRE Verbal (GREV) percentile scores. Unexpected were, 1) lack of correlation between student performance and both GREV and GREQ in Science Materials and Library Administration classes, and 2) differing results for two sections of Reference Services in the Humanities.

The difference between the results for the two reference classes may have been caused by lack of continuity between instruction and testing in one of them. One instructor was responsible for testing and assigning grades to both sections,

CLASS		n	GPA	GREV	GREQ	RECS	STATEMENT	METHOD
Science Materials for Nonspecialists		26	.39*	-.09	-.26	-.08	.25	r_{bis}
Library Materials for Children		14	.48*	.16	.07	.16	.58*	Tau
Audiovisual Services in Libraries		17	.26	.25	.46*	-.08	.33	Tau
Library Administration		25	.44*	-.03	-.11	.49*	.48*	r_{bis}
Cataloging and Classification		51	.24*	.30*	.27*	-.09	.06	Tau
Reference Service in the Humanities and Social Sciences	A	23	.42	.61*	.32	.18	-.32	r_{bis}
	B	35	.11	.52*	.00	-.01	.27	r_{bis}
Science Reference Materials for Specialists		17	.31	.48	.38	.16	-.02	r_{bis}
Library Automation		45	.20*	.29*	.47*	-.05	.15	Tau
Information Storage and Retrieval		30	.23*	.26*	.16	-.06	.15	Tau
Books and Libraries in the Ancient and Medieval World		6	.41	.60	-.07	-.28	.07	Tau
Contemporary Book Publishing		16	.00	.53	.41	-.52	.16	r_{bis}

TABLE II. CORRELATIONS OF PREDICTORS AND CLASS PERFORMANCE.

Tau: Kendall's Tau
r_{bis}: biserial correlation coefficient
n: number of students in sample
*: significant at Alpha = .10

but a substitute lecturer was used in one of the sections during much of the semester. The instructor who assigned the grades commented that poor morale led to poor performance of many students in the substitute-lecturer class. More students in the substitute-lecturer class received low grades than in the other class, and the spread of grades probably reflects the reasons that correlation between student performance and most of the tested variables was stronger in the substitute's class.

EVALUATION BY GRADUATING GPA

Total GSLS class performance prediction ability was examined for a different sample, the Master's degree candidates who arrived in summer and fall of 1973. One hundred ten new students were accepted and entered school. Three were dropped from the sample because their records did not include GRE scores or work-experience and letter-of-reference data. Ten part-time students were also excluded as special cases. The remaining ninety-seven students' selection variables were correlated with their grade point average at the end of the 1973-74 school year. The results appear in Table III.

The GGPA computed by the University of Illinois is based on whole letter grades, disregarding plus and minus information. Most of the instructors at the GSLS, however, do assign plus and minus grades. To utilize the information contained in the

POPULATION PARAMETERS

Variable	Mean	Standard Deviation	n
GGPA	6.806	0.725	97
UGPA	4.455	0.322	97
GREV	75.649	17.922	97
GREQ	58.237	21.984	97
WORK	9.237	6.204	97
RECS	22.454	2.500	97
STMT	7.742	1.445	97

CORRELATION COEFFICIENTS

	GGPA	UGPA	GREV	GREQ	WORK	RECS	STMT
GGPA	1.000	0.322	0.167	0.241	-0.250	0.055	-0.099
UGPA	0.322	1.000	0.125	0.052	-0.258	0.129	-0.018
GREV	0.167	0.125	1.000	0.316	-0.289	-0.161	0.138
GREQ	0.241	0.052	0.316	1.000	-0.185	-0.042	-0.066
WORK	-0.250	-0.258	-0.289	-0.185	1.000	0.258	0.004
RECS	0.055	0.129	-0.161	-0.042	0.258	1.000	0.157
STMT	-0.099	-0.018	0.138	-0.066	0.004	0.157	1.000

TABLE III. POPULATION PARAMETERS AND COEFFICIENTS OF CORRELATION FOR ENTRANCE VARIABLES AND GRADUATE GRADE POINT AVERAGE.

GGPA: Measured on a 9-point scale (See Table IV.).
UGPA: Measured on a 5-point scale.
GREV: Verbal test percentile, 0-99.
GREQ: Quantitative test percentile, 0-99.
WORK: Library experience on a 15-point scale (See Table I.).
RECS: Recommendations on a 30-point scale.
STMT: Personal goals statement on a 10-point scale.

plus and minus grades, GGPA was recomputed for each student on a scale from nine to zero, A+ to D+, as shown in Table IV. All tests were duplicated using the less informative "pure" GGPA's provided by the University, and not surprisingly, they yielded results in ratio with those reported below, but with lower correlations.

The sample was very biased in that it consisted entirely of accepted students at one school for one particular year. Twelve students had Master's degrees in other subjects, and two had the PhD degree. The greatest biasing factor was limitation of the sample to accepted students. Since the independent variables were used to screen sample membership, their range was curtailed. Srinivasan and Weinstein[12] created a model to predict how well rejected Management students would have performed, had they been admitted to a program. Such a model could contribute to understanding of the relationships examined below. However, the modeling procedures are complex, and for the limited conclusions to be drawn from this sample, it was simply assumed that observed correlations extended some distance into the unmeasured rejected-student range.

A multiple regression analysis was performed on the data using the Statistical Package for the Social Sciences (SPSS)

A+	9
A	8
A-	7
B+	6
B	5
B-	4
C+	3
C	2
C-	1
D+	0

TABLE IV. GRADUATE GRADE POINT AVERAGE SCALE.

data analysis system on an IBM 360-75 computer. Independent variables which had shown positive correlation with GGPA, i.e., undergraduate grade point average (UGPA), GRE verbal test (GREV), GRE quantitative test (GREQ) and personal recommendations (RECS), were examined to see how well they could predict GGPA. It was arbitrarily assumed, to simplify computation, that the variables were sufficiently independent of each other's influence that step-wise regression was unnecessary.

Most multiple regression procedures require certain assumptions regarding the data. It must be interval or ratio, be randomly selected, and have linear regression. The dependent variable must have constant variance for all combinations of independent variables.

The variables in this test were all measured on a ratio scale; they were graded at intervals from a zero base. Although the sample was not random, it was considered to be almost the entire population of one specific student category.

Visual inspection of scatter diagrams revealed no nonlinear relationship between any independent variable and GGPA. Tully[15] reported a similar situation in his examination of GRE, UGPA and GGPA.

None of the scatter diagrams showed reasonable cutoff thresholds for applicant rejection. Setting individual cutoff

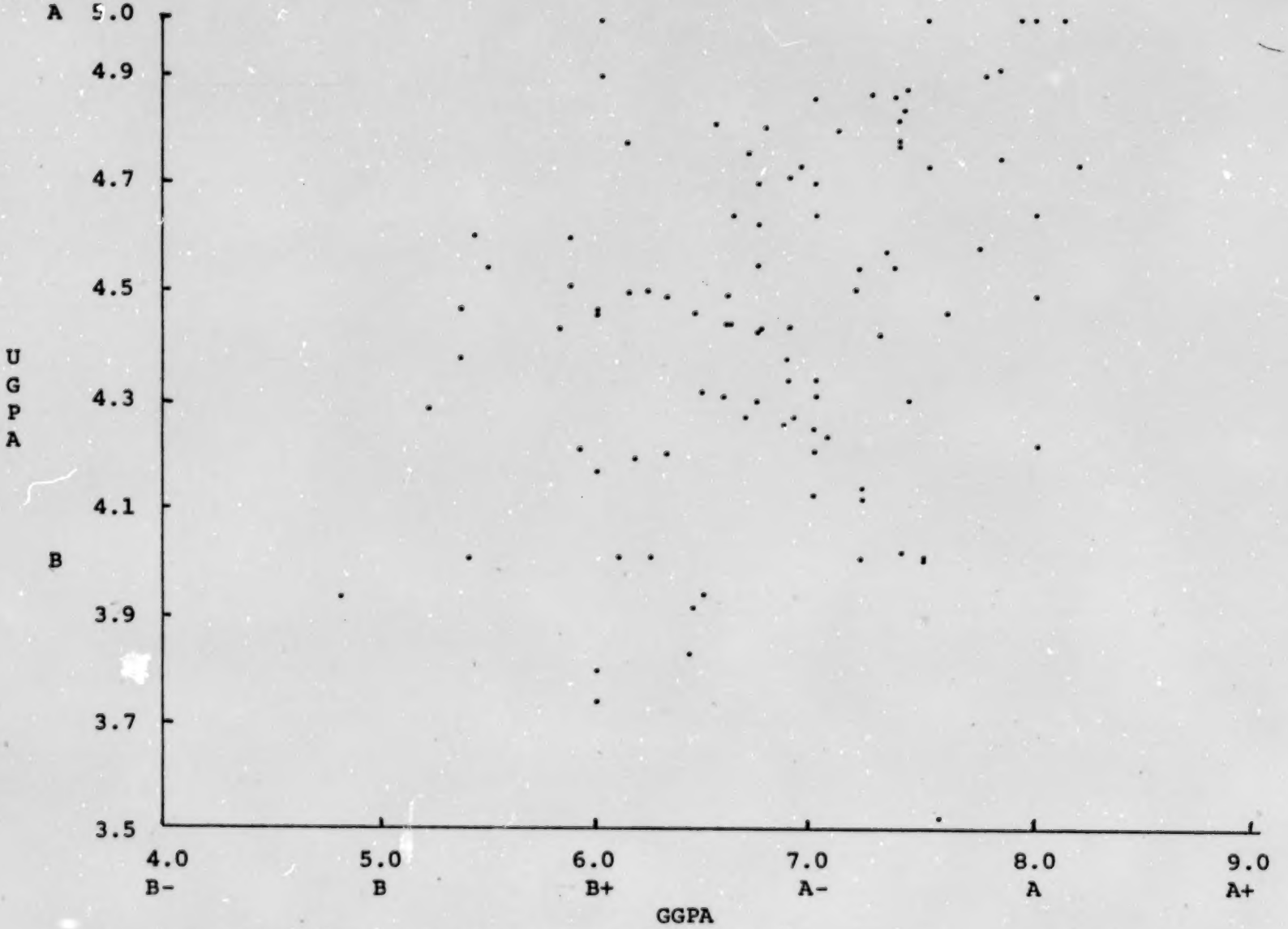

FIGURE I. UNDERGRADUATE AND GRADUATE GRADE POINT AVERAGES. SCATTER DIAGRAM.

thresholds would have removed more "successful" students than unsuccessful ones. (In Figure I for example, note the GGPA range of the eight students who had UGPA's below 4.0.) Baillie[1] arrived at similar conclusions concerning cutoffs, as did Borg[3] in an examination of education students' performance. Although an upper threshold did appear to exist for acceptance on the basis of high UGPA (The thirty-two students with UGPA above 4.6 all finished with GGPA's of B+ or higher, as illustrated in Figure I.), all students in that category did so well on other admission factors that there was no danger of their rejection. There was no case of very high UGPA with low scores on other variables to observe in the sample. Tully's study of graduate student performance in several departments at Florida State University[15] was especially important in that the sample group was essentially not predetermined by the test variables. He arrived at the same basic conclusion as others with more restricted samples: "The multiple regression procedure for organizing predictive data...led to a significantly higher proportion of correct (acceptance and rejection) decisions than the multiple screen (multiple cutoffs)."

Table V shows the joint effect regression statistics. The correlation between GGPA and the independent variables was 0.399. A surprisingly small amount of the variation in

Correlation (Multiple R)	0.399	DF	4, 92
Fraction controlled by Ind. Variable (R Square)	0.160	F	4.367
Standard Error	0.679		

TABLE V. JOINT EFFECT OF UGPA, GREV, GREQ, AND RECS ON GGPA.

GGPA was explained by linear regression on UGPA, GREV, GREQ and RECS: R square reflected only about sixteen percent. However, the hypothesis that none of the variability of GGPA was determined by the independent variables would have been rejected at the 99.5 percentile level. The F value was 4.367 with four and ninety-two degrees of freedom.

Including the independent variables with negative correlations (personal statements and work experience) increased correlation (multiple R) to 0.435 and the amount predicted by independent variables to nineteen percent (R square = 0.189). It does not seem practical to act on the basis of those nonsignificant negative correlations, as it would increase likelihood of rejecting applicants with the best-written personal data paragraphs and most library work experience.

Table VI shows the effect of the individual independent variables on GGPA. The equation for optimum prediction based on that information is

$$GGPA = 2.962 + .671(UGPA) + .003(GREV) + .007(GREQ) + .011(RECS)$$

Table I explains how the independent variables were derived. The average deviation from predicted GGPA for the sample, i.e., the standard error of estimate for the regression equation, was 0.679 grade point units, less than the difference

VARIABLE	FACTOR OF EFFECT (B)	STANDARDIZED % OF EFFECT (BETA)	STD ERROR OF FACTOR	F	DF
UGPA	0.671	0.298	0.219	9.359	1, 92
GREV	0.003	0.071	0.004	0.479	1, 92
GREQ	0.007	0.205	0.003	4.136	1, 92
RECS	0.011	0.037	0.028	0.144	1, 92
(CONSTANT)	2.962				

TABLE VI. INDIVIDUAL EFFECT OF UGPA, GREV, GREQ, AND RECS ON GGPA.

between a B+ and a B.

The beta weights listed in Table VI also show the coefficient standardized. Since units are standardized, the beta weights show the proportion of effect contributed by each of the independent variables. Ninety-ninth percentile F-tests indicated that GREQ and UGPA had significant correlation with GGPA RECS and GREV correlations showed no significance, even at the seventy-fifth percentile level.

The GREV score's weakness as a predictor and the GREQ's strength were surprising in light of the amount of reliance on written communication (assigned papers and examinations) for student assessment assumed to exist at the GSLS. Baillie[1] also found GREQ to have higher correlation than GREV with GGPA, but the difference was much smaller: $r_{GREV} = .34$ and $r_{GREQ} = .39$. The difference is difficult to account for. Perhaps students who apply for library school are self-selecting to those with literary ability and uniformly high GREV scores. Borg[3] suggests that conscious selection of students with humanities backgrounds allows a greater, more easily measured range of student quantitative abilities into graduate programs in Education. It is also possible that quantitative skills can be measured more accurately than verbal skills, both at GRE time and in graduate school. That might also partly account for the lack

of correlation found between the quality of students' written goals statement and subsequent graduate performance.

The slight negative correlation between work experience and GGPA also seemed hard to explain. However, when the seventeen students who already had graduate degrees in other subject areas were removed from the sample and the tests were rerun, the work experience to GGPA relationship changed substantially. Multiple regression analysis was performed on first the full sample and then the sample with the graduate-degree holders removed, with work experience replacing RECS as an independent variable in combination with UGPA, GREV and GREQ. The simple correlation between work experience and GGPA only changed from -.250 to -.206, but the beta weight changed from -.137 to -.040, and its F ratio dropped from 1.073 to 0.124. Since the mean number of points for work experience assigned in the selection process dropped from 9.700 to 9.237, the comparative lack of library work experience among graduates from other fields apparently combined with their slightly-above-average GGPA to produce some of the negative correlation between work experience and GGPA.

CONCLUSIONS

The effectiveness of the presently used criteria to predict successful performance in a graduate library school

appears to be very low. Part of the poor correlation may be due to the biased sample used to test the predictors. Instructors with varying attitudes, teaching styles and evaluation methods doubtless contribute to the problem, as do students with different classloads, subject specializations and learning goals. Concurrent classes from other departments and schools may also have some confusing effect.

A factor which is a strong predictor for performance in some classes but weak in others is likely to be only moderately effective as a predictor of total performance as measured by the GGPA. That loss of distinctness makes examination of performance in individual classes especially important in future searches for causality and ways to improve prediction. If a school wants to concentrate its resources on a particular line of study, e.g., Information Science or History, finding factors which determine success in specific classes could help select students who would be likely to excel in the school specialty. The literature seems to have no information or studies to suggest this.

The regression equation derived here needs to be tried on other samples. New samples should be used to generate regression analysis information and equations which could be compared to that found here. UGPA and GRE-type tests seem worthy of the

most attention, but other selection factors should be examined unless or until there is strong evidence that they are ineffective.

There is injustice inherent in selection of students by predictors that account for less than twenty percent of the likelihood of successful performance in graduate study, but until better criteria are found, it is the best that can be done. The only clear alternative that would yield more successful students is to increase the number of unsuccessful students, i.e., open enrollment to all who apply and increase the failure rate.

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